6.6 13

$$\int_4^9 2x\sqrt{x}\,dx = 2\int_4^9 x^1\cdot x^{\frac12}\,dx = 2\int_4^9 x^{\frac32}\,dx$$

$$= 2\left(\frac{x^{5/2}}{5/2}\right)\Bigg|_4^9 = \left(\frac45 x^{5/2}\right)\Bigg|_4^9$$

$$= \frac45\left[(9^{1/2})^5 - (4^{1/2})^5\right] = \frac45[243-32]$$

$$= \frac45(211) = \frac{844}{5}$$

$\sin^{-1}\left(\frac{1}{\sqrt2}\right)$ $\sqrt2$, 1, 1, θ $= \frac{\pi}{4}$

Jan 5-7:35 AM

6.6 21

$$\int_0^{\frac{1}{\sqrt2}} \frac{1}{\sqrt{1-x^2}}\,dx$$

$$= \left[\sin^{-1}(x) + 1{,}000{,}000{,}000\right]\Bigg|_0^{\frac{1}{\sqrt2}}$$

$$= \left(\sin^{-1}\left(\frac{1}{\sqrt2}\right) + 1{,}000{,}000{,}000\right) - \left(\sin^{-1}(0) + 1{,}000{,}000{,}000\right)$$

$$= \frac{\pi}{4} - 0 = \frac{\pi}{4}$$

$\sqrt2$, $45°$, 1, 1

Jan 5-7:35 AM

$$\int (1-x^2)^{-\frac12}\,dx \qquad \int x^{-\frac12}\,dx$$

$$\Downarrow$$

$$\frac{x^{\frac12}}{\frac12} + C$$

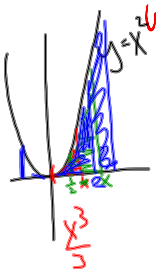
$$2(1-x^2)^{1/2} + C$$

$$2\left(\frac12(1-x^2)^{-\frac12}(-2x)\right)$$

Jan 5-7:35 AM

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

where $F(x)$ is Any antiderivative



Jan 5-7:35 AM

Fundamental Theorem of Calculus-2

$$\frac{d}{dx}\left(\int_a^x f(t)\,dt\right) = f(x)$$

Jan 5-7:53 AM

$$g(x) = \int_a^x f(t)\,dt$$

$$g(x) = \int_1^x t^2\,dt = \frac{t^3}{3}\Bigg|_1^x$$

$$g(x) = \frac{x^3}{3} - \frac13$$

$$g'(x) = x^2$$

Jan 5-8:00 AM

FTC-2 variable

$$\frac{d}{dx}\left(\int_a^{x} f(t)\,dt\right) = f(x)$$

$$\frac{d}{dx}\left(\int_{\frac{\pi}{2}}^{x} \cos t\,dt\right) =$$

$$\frac{d}{dx}\left(\left(\sin t\right)\Big|_{\frac{\pi}{2}}^{x}\right) = \frac{d}{dx}\left(\sin(x) - \sin\tfrac{\pi}{2}\right)$$

$$= \frac{d}{dx}\left(\sin x - 1\right) = \cos x - 0$$

$$= \cos x$$

Jan 5-8:03 AM

$$\frac{d}{dx}\left(\int_3^{x^2} \ln t\,dt\right)$$

$\int \ln x\,dx$

$= x\ln x - x + C$

$$\ln(x^2)\cdot(2x)$$

$$\frac{d}{dx}\left(\left(t\ln t - t\right)\Big|_3^{x^2}\right)$$

$$= \frac{d}{dx}\left(x^2\ln x^2 - x^2 - (3\ln 3 - 3)\right)$$

$$= \left(2x\ln x^2 + x^2\left(\frac{1}{x^2}(2x)\right)\right) - 2x - 0$$

$$= 2x\ln x^2 + 2x - 2x - 0$$

$$= 2x\ln x^2$$

Jan 5-8:09 AM

$$\frac{d}{dx}\left(\int_0^{\cos x} e^t\,dt\right)$$

$$\underbrace{\left(e^{\cos x}\right)}_{1}\underbrace{\left(-\sin x\right)}_{2}$$

$$\frac{d}{dx}\left(\int_0^{\cos x} e^t\,dt\right)$$

$$= \frac{d}{dt}\left(e^t\Big|_0^{\cos x}\right) = \frac{d}{dx}\left(e^{\cos x} - 1\right)$$

$$= (-\sin x)e^{\cos x}$$

Jan 5-8:17 AM

HW

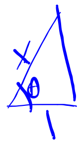
6.6 / 23-27, 49-54, 58

$\sec^{-1}(x)$ = the angle whose secant is x

= the angle whose cosine is $\frac{1}{x}$

$= \cos^{-1}\left(\frac{1}{x}\right)$

$\sec = \frac{1}{\cos} = \frac{H}{A}$



Jan 5-8:21 AM

6.6/14

$$\int_1^8 5x^{2/3} - 4x^{-2}\,dx$$

$$= 5\int_1^8 x^{2/3}\,dx - 4\int_1^8 x^{-2}\,dx$$

$$= \left[5\left(\frac{x^{5/3}}{5/3}\right) - 4\left(\frac{x^{-1}}{-1}\right)\right]\Bigg|_1^8 =$$

$$= \left(3x^{5/3} + \frac{4}{x}\right)\Big|_1^8 = \left[3(2^5) + \frac{4}{8}\right] - \left[3(1)^{5/3} + \frac{4}{1}\right]$$

$$= 96\tfrac{1}{2} - 7 = 89\tfrac{1}{2}$$

Jan 5-11:24 AM

Fundamental Theorem of Calculus-2

$$\frac{d}{dx}\left(\int_a^x f(t)\,dt\right)$$

$$= f(x)$$

FTC-1

$\int_a^b f(x)\,dx = F(b) - F(a)$ where $F(x)$ is ANY antideri

Jan 5-11:24 AM

$$\frac{d}{dx}\left(\underbrace{\int_1^x t^2\,dt}\right)$$

$$\frac{d}{dx}\int_1^x f(t)\,dt = f(x)$$

$$= \frac{t^3}{3}\Big|_1^x = \frac{x^3}{3} - \frac{1}{3}$$

$$\frac{d}{dx}\left(\frac{x^3}{3} - \frac{1}{3}\right)$$

$$= x^2$$

Jan 5-11:24 AM

$$\frac{d}{dx}\int_{\frac{\pi}{2}}^{x} \cos t\,dt$$

$$\frac{d}{dx}\left((\sin t)\Big|_{\pi/2}^{x}\right) = \frac{d}{dx}\left(\sin x - \sin\frac{\pi}{2}\right)$$

$$= \frac{d}{dx}(\sin x - 1) = \cos x$$

Jan 5-11:24 AM

$$\frac{d}{dx}\left[g(x)\int_1^{x^2} \ln t\,dt\right]$$

$$\int \ln t\,dt = t\ln t - t + C$$

FTC

$$\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

$$\frac{d}{dx}\left((t\ln t - t)\Big|_1^{x^2}\right)$$

$$= \frac{d}{dx}\left[(x^2\ln x^2 - x^2) - (\ln 1 - 1)\right]$$

$$= \left[(2x)(\ln x^2) + x^2\left(\frac{1}{x^2}(2x)\right)\right] - 2x$$

$$= 2x(\ln x^2) + 2x - 2x = 2x(\ln x^2)$$

$$\frac{d}{dx}\int_1^{x^2} (\ln t)\,dt = (\ln x)\frac{d}{dx}(x^2)$$

Jan 5-11:24 AM

$$g(x) = \int_1^x \ln t\,dt$$

$$g'(x) = \ln x$$

$$g'(x^2) = g'(x^2)\cdot\frac{d}{dx}(x^2)$$

$$\ln(x^2)\cdot(2x)$$

$g(f(x))$

chain rule:

$$[g(f(x))]' = g'(f(x))\cdot f'(x)$$

Jan 5-12:07 PM

FTC-2

$$\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

variable

number

$$\frac{d}{dx}\int_a^{g(x)} f(t)\,dt = f(g(x))\cdot g'(x)$$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dt}(\ln(t^2)) = \left(\frac{1}{t^2}\right)(2t)$$

Jan 5-12:10 PM

$$\frac{d}{dx}\int_0^{\cos x} e^t\,dt$$

$\cos x$ is not a plain x. Therefore use chain rule

$$\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

$$= \left(e^{\cos x}\right)\left(\frac{d}{dx}(\cos x)\right)$$

$$= -\sin x\left(e^{\cos x}\right)$$

Jan 5-12:13 PM

how do I recognize FTC-2?

$$\frac{d}{dx}\int_{a}^{g(x)} f(t)\,dt = f(g(x))\cdot g'(x)$$

$g(x)$ → variable (or function)

$\frac{d}{dx}$ → derivative

a → #

Jan 5-12:20 PM